भारतीय मानक
Indian Standard

IS 8947 : 2021

वस्त्रादि — वायुयान सुरक्षा पेटी के लिये सामग्री (नॉइलान वेबिंग) — विशिष्टि

(पहला पुनरीक्षण)

Textiles — Material (Nylon Webbing) for Aircraft Safety Belts — Specification

(First Revision)

ICS 59.080.50; 49.025.01

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by Textile Materials for Aeronautical and Related Products Sectional Committee had been approved by the Textile Division Council.

The nylon webbing covered in this standard is used in making aircraft safety belts. This standard was first published in 1978. It has been revised to align it with latest trade practices. In this revision, the sampling plan has been aligned with the latest international standards on sampling.

This standard is based on MIL-W-4088 Webbing, nylon, textile, latex impregnated, issued by the Department of Defence, United States of America.

The composition of the Committee responsible for the formulation of this standard is given in Annex E.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

TEXTILES — MATERIAL (NYLON WEBBBING) FOR AIRCRAFT SAFETY BELTS — SPECIFICATION

(First Revision)

1 SCOPE

This standard prescribes the constructional details and other particulars of nylon webbing, dyed or in natural colour, for manufacturing safety belts used by aircraft passengers.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

3 MATERIAL, WORKMANSHIP AND FINISH

3.1 The nylon yarn used for making nylon webbing should be of high tenacity [0.7 N/tex (8 gf /d), *Min*] and count 93 tex (840 d).

3.2 The webbing shall be well and evenly woven with firm selvedges. The webbing may be treated as specified in the contract or order.

3.3 The webbing shall be either piece dyed or yarn dyed to the required shade. The dyeing shall be done before application of any finishing agent and before being impregnated with latex. Metallized or chrome dyes shall not be used.

3.4 In the manufacture of the webbing such dyestuffs, detergents, curatives, impregnating compounds, other chemicals or finishing agents shall not be used which are liable to cause deterioration under normal storage conditions, cause dermatitis on prolonged intimate skin contact or increase the flammability of the webbing.

3.5 In respect of the requirements not covered in this standard, the webbings shall not be inferior to the sealed sample as agreed to in the contract or order.

4 REQUIREMENTS

4.1 The webbing shall be woven in 2/2 harringbone twill weave with three reversals.

4.2 The webbings shall meet the physical requirements given in Table 1.

4.3 The webbings shall also meet the chemical requirements given in Table 2.

4.4 The custody of the sealed sample shall be a matter of prior agreement between the buyer and the seller.

Table 1 Physical Requirements of Nylon Webbing

(*Clause* 4.2)

Sl No.	Characteristic	Requirement	Method of Test
(1)	(2)	(3)	(4)
i)	Length per roll	100 m or as agreed	IS 1954
ii)	Width, mm	50.0 + 1.5	IS 1954
iii)	Number of ends in full Width, *Min*	196	IS 1963
iv)	Picks per dm, *Min*	67	IS 1963
v)	Weight of webbing per m (Linear), *Max*	75	IS 1964
vi)	Thickness under a pressure of 20.6 kN/m^2 (210 gf/cm^2), mm, *Max*	1.9	IS 7702
vii)	Breaking load on 20 cm between grips, kN (kgf), *Min*	19.6 (2000)	IS 1969 (Part 1)
viii)	Shrinkage (Thermal), percent, *Max*	2	*see* NOTE

NOTE — Guidance for testing may be obtained from IS 4910 (Part 5) : 1989.

5 ATMOSPHERIC CONDITIONS FOR TESTING

5.1 The tests shall be carried out in the standard atmosphere (*see* **5.2**).

5.2 Conditioning of Test Specimen

The test samples shall be conditioned to a state of moisture equilibrium from dry state in standard atmosphere at 65 ± 5 percent relative humidity and 27 ± 2 °C temperature (*see also* IS 6359).

Table 2 Chemical Requirements of Nylon Webbing

(*Clause* 4.3)

Sl No.	Characteristic	Requirement	Method of Test
(1)	(2)	(3)	(4)
1	Colour fastness to light (Dyed webbings only)	5 or better	IS/ISO 105-B01 : 2014 or IS/ISO 105-B02 : 2014
2	Colour fastness to washing (Dyed webbings only)	4 or better	IS/ISO 105-C10 : 2006 [Test Number A (1)]
3	Resistance to abrasion	Shall not lose more than 5 percent of its original breaking strength	Annex G of IS 4727
4	Resistance to accelerated Weathering	Shall not lose more than 20 percent of its original breaking strength	Annex E of IS 4727
5	Resistance to cold and pliability	Shall not display any appreciable stiffness or change in pliability	Annex B of this standard
6	Resistance to accelerated weathering (oven method)	Shall not be sticky or gummy and shall not lose more than 5 percent of its original breaking strength	Annex C of this standard
7	Resistance to combustion	Shall be flame resistant	IS 11871 : 1986

6 MARKING

6.1 Each roll shall be legiblv marked with the following information:

a) Name of the material;

b) Length of webbing contained in a roll;

c) Year of manufacture; and

d) Manufacturer’s name, initials or trade-mark, if any.

6.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

7 PACKING

The webbing shall be made into rolls of 100 m unless otherwise specified in contract or order. Any roll may contain up to a maximum of 3 short length pieces provided none of the short length piece is less than 10 m in length. A suitable number of rolls shall be arranged in the form of cylindrical bundles and secured by jute twine to form a pack. A suitable number of such packs shall be wrapped in polyethylene film (*see* IS 2508) of at least 40 microns thickness and the bundles shall be placed in a wooden packing case lined with one layer of waterproof packing paper. The gross mass of the case shall not exceed 40 kg.

8 SHELF LIFE

The normal shelf life of webbing under ideal conditions should be 10 years. After this period, the webbing shall be retested and the shelf life extended by another 5 years.

9 SAMPLING AND INSPECTION

The sampling and inspection procedure shall be as detailed in the contract or order, however, if so specified in the contract, the procedure as given in Annex D may be followed.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No	*Title*	*IS No*	*Title*
1383 : 1970	Methods for determination of scouring loss in grey and finished cotton textile materials	1969 (Part 1) : 2018/ ISO 13934-1 : 2013	Textiles — Tensile properties of fabrics: Part 1 Determination of maximum force and elongation at maximum force using the strip method
1398 : 1982	Specification for packing paper water proof, bitumen-laminated (*second revision*)	2508 : 2016	Polyethylene films and sheets — Specification (*third revision*)
1390 : 2019/ ISO 3071 : 2005	Textiles — Determination of *p*H of aqueous extract (*second revision*)	4905 : 2015/ ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
1954 : 1990	Determination of length and width of woven fabrics-methods	4910 (Part 5) : 1989	Tyre yarns, cords and tyre cord warpsheets made from man-made fibres — Method of test: Part 5 Heat shrinkage and heat shrinkage force (*first revision*)
1963 : 2004	Methods for determination of threads per unit length in woven fabrics	6359 : 1971	Method for conditioning of textiles
1964 : 2001	Methods for determination of mass per unit length and mass per unit area of fabrics	11871 : 1986	Methods for determination of flammability and flame resistance of textile fabrics

ANNEX B

(*Table* 2)

METHOD FOR DETERMINATION OF RESISTANCE TO COLD AND PLIABILITY

B-L TEST SPECIMENS

For the purpose of this test, all treated webbing rolls in the test sample shall constitute the test specimen.

B-2 PROCEDURE

The specimens shall be 20 cm long. One unaged webbing and another subjected to the accelerated weathering test shall be suspended in a cold chamber, maintained at a temperature of – 54 ± 1 °C for 4 h ± 15 min. At the end of this period, the specimens, while in the cold chamber shall be flexed manually and their pliability shall be compared with an ‘as received’ specimen flexed outside the cold chamber at room temperature.

ANNEX C

(*Table* 2)

METHOD FOR DETERMINATION OF RESISTANCE TO ACCELERATED WEATHERING (OVEN METHOD)

C-L TEST SPECIMEN

For the purpose of this test, all the rolls in the test sample shall constitute the test specimen.

C-2 PROCEDURE

Take a specimen of treated webbing and keep it in an oven, maintained at a temperature of 70 ± 1 °C, for a period of 7 days. After expiry of seven days, remove the webbing and allow it to cool to room temperature. Examine whether the specimen is free from stickiness or gumminess and test it for breaking load, by the method given in Table 1.

ANNEX D

(*Clause* 9)

PROCEDURE FOR INSPECTION AND TESTING

This sampling, inspection and testing scheme is based on that given in MIL-W-4088F Webbing, textile, woven, nylon, issued by the Government of USA.

D-1 RESPONSIBILITY FOR INSPECTION

Unless otherwise specified in the contract or purchase order, the supplier shall be responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any recognized testing laboratory acceptable to the purchaser. The purchaser reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to the prescribed requirements.

D-2 TYPE TESTS

For warp, weft and binder yarn, the following tests shall be carried out as type tests:

a) Identification,
b) Denier/tex,
c) Tenacity,
d) Lustre,
e) Melting point,
f) Light resistance,
g) Heat resistance,
h) Unbleached,
i) Ply, and
j) Turns/twist.

NOTE — The supplier shall submit a certificate of' compliance for these characteristics. The certificate shall be accompanied by actual test, inspection or other verifiable quality data.

D-3 OVERALL EXAMINATION

Each defect given below shall be counted not more than once in each roll examined which would be selected according to sampling plan given in **D-4.2**:

a) Off shade (not within tolerance);
b) Objectionable odour;
c) Off shade, that is, not within established tolerance;
d) Uneven dyeing, shaded, spottiness, poor penetration;
e) Uneven weaving throughout; and
f) Identification yarns misplaced, missing, or of wrong colour.

D-4 METRE BY METRE EXAMINATION

D-4.1 The required length of each piece shall be examined on both sides for visual defects classified as follows. All defects found shall be counted regardless of their proximity to one another, except where two or more defects represent a single local condition of the webbing; in that case only the more serious defect shall be counted. A continuous defect shall be counted as one defect for each warp-wise metre of or fraction thereof in which it occurs. The sample unit for this examination shall be one linear metre. No critical defect shall be allowed but Acceptance Quality Level for minor defects is 2.5/100 m of sample tested:

Defect	*Description*	*Critical*	*Minor*
1) Abrasion marks	Resulting in rupture of yarns or in neps sufficient to obscure the identity of any yarn exceeding 10 percent of width or 25 mm in length	X	
2) Broken or missing end	Two or more, regardless of length, a single and exceeding 150 mm in length Single end under 150 mm but exceeding 6 mm	X	X
3) Broken or missing pick	Two or more regard less of extent NOTE — The weft tie-in or joining shall not be construed as a defect of any nature	X	
4) Coarse or light weft bar	Resulting in visible difference in stiffness or thickness of webbing and extending for more than 6 mm in the length direction Resulting in visible difference in stiffness or thickness or webbing and extending for 6 mm or less in the length direction	X	X
5) Twist or distortion	Webbing shall not lay-in flat upon application of manual pressure due to twist or distortion		X
6) Cut, hole, or tear	Any cut, hole or tear	X	
7) Drop-ply	Clearly visible on more than 2 ends within same length and extending over 230 mm or more* Clearly visible on 1 or 2 ends within same length and extending over 230 mm or more*	X	X
8) Edges	Frayed, slack or otherwise poorly constructed and exceeding 6 mm in length	X	
9) Floats or skins	Three or more 13 mm or more in combined warp and weft directions or single float or skip over more than 25 m Three or more, less than 13 mm in combined warp or weft directions or single float or skip over more than 13 mm but not exceeding 25 mm if in warp, or more than 6 mm of width but not exceeding 25 mm if in weft	X	X
10) Hitchback crack	Clearly visible opening between adjoining picks, or warpwise tension area over part of the width resulting in visible light and heavy places*		X

Defect	*Description*	*Critical*	*Minor*
11) Jerked-in weft, slough-off slug	A clearly visible weft loop pulled in at edges*		X
12) Kinks	More than 3 in any 230 mm	X	
13) Knots	More than 1 knot in any 230 mm One knot every 2 m with untrimmed ends extending from surface of webbing	X	X
14) Mispick, double pick	Two or more across the full width Single across the full width	X	X
15) Slack end	Two or more in the same length, jerked in between picks, or forming clearly visible loops on the surfaces Single jerked in between picks or forming clearly visible loops on the surface	X	X
16) Slub, slug, gout	More than twice the thickness of the yarn (or ply, if plied)		X
17) Smash	Any smash	X	
18) Spot, stain or streak	Any clearly visible dirt, rust, grease, oil spot, stain or streak* *When webbing is to be in natural colour for use in special purpose items, any spot, stain or streak up to 305 mm in length that can be covered with an approved white spotter shall be minor. Any spot, stain or streak that cannot be covered or is longer than 305 mm shall be a critical defect.		X
19) Tight end	Clearly visible up to 305 mm in length	X	
20) Wrong draw	Extending for more than 230 mm	X	
21) Width	Beyond specified tolerance		X

*Clearly visible at normal inspection distance (approximately 1 m)

D-4.2 The following sampling plan may be employed for non-destructive tests:

Lot Size m	*Sample Size* (*Rolls*)	*Maximum Number of Defects Acceptable in Sample*
up to 1 200	3	0
1 201 to 3 200	5	0
3 201 to 10 000	8	0
10 001 to 35 000	13	0
35 001 to 150 000	20	1
150 001 and over	32	2

D-5 EXAMINATION FOR LENGTH OF INDIVIDUAL ROLL

D-5.1 Each roll in the sample shall be examined for the defects given below. The sample unit for this examination shall be one roll. The sample size and acceptance number shall be as given in **D-4.2**:

a) Gross length less than that declared by more than 2 m,

b) Any piece less than 10 m length, and

c) Any roll containing more than 3 pieces.

D-5.2 Examination for Total Length in Sample

The lot shall be unacceptable if the total of the actual gross length of rolls in the sample selected in accordance with **D-4.2** is less than the total of the declared gross length.

D-6 TESTING OF FINISHED PRODUCT

Except for breaking strength, other requirements are average of the readings recorded for the test specimens against the relevant Indian Standards on methods of tests. The sample size shall be as follows:

Lot Size m	*Sample Size* m
up to 800	2
801 to 22 000	3
Above 22 000	5

NOTES

1 The length of webbing (m) supplied in a consignment shall form the lot.

2 In case of breaking strength no individual reading shall be less than that specified.

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Textile Materials for Aeronautical and Related Products Sectional Committee, TXD 13

Organization	*Representative(s)*
Aerial Delivery Research and Development Establishment, Agra	Shri A. K. Saxena (***Chairman***)
Air Headquarters, Ministry of Defence, New Delhi	GP Capt S. K. Chatterjee WG CDR S. Nagrajan (*Alternate*)
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Member Secretary

Shri P. N. Murali
Scientist 'D' (Textiles), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

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